

advantages mentioned, as well as those inherent therein. While a preferred embodiment of the invention has been shown for the purposes of this disclosure, numerous changes in the arrangement and construction of parts may be made by those skilled in the art. All such changes are encompassed within the scope and spirit of the appended claims.

What is claimed is:

1. A cementing plug for use in cementing casing in a well, comprising:

a body member defining a central opening therethrough; an elastomeric jacket disposed around said body member and having a wiper cup extending therefrom for engaging an inner surface of the casing;

an insert disposed across said central opening in said body member for closure thereof, said insert being one of a plurality of interchangeable inserts; and

wherein said insert is a shearable member adapted for shearing and opening said central opening when a predetermined differential pressure is applied across said shearable member or a substantially non-shearable disk adapted for substantially permanent closure of said central opening.

2. The plug of claim 1 wherein said shearable member is made of a rupturable material.

3. The plug of claim 1 wherein said shearable member is a substantially flat disk having a substantially uniform thickness.

4. The plug of claim 1 wherein said shearable member comprises:

a ring portion; and
a domed portion extending from said ring portion.

5. The plug of claim 1 wherein:

said body member defines a shoulder in said central opening; and
said insert is disposed on said shoulder.

6. The plug of claim 1 wherein said wiper cup is one of a plurality of such wiper cups.

7. The plug of claim 1 wherein said wiper cup has an conical outer surface extending upwardly and outwardly at an acute angle with respect to a longitudinal axis of the plug.

8. A cementing plug for use in a cementing casing in a well, comprising:

a body member defining a central opening therethrough and having a longitudinal axis;

an elastomeric jacket disposed around said body member and having a wiper cup extending therefrom, said wiper cup defining a conical outer surface extending upwardly and outwardly at an acute angle with respect to said longitudinal axis, wherein said outer surface is deflected into substantially cylindrical, wiping engagement with an inner surface of a casing when the plug is disposed therein;

an insert disposed in said central opening for at least temporary closure thereof, said insert being a selected one of a plurality of inserts; and

wherein said insert is a shearable member adapted for shearing and opening said central opening when a predetermined differential pressure is applied across said shearable member or a substantially non-shearable disk adapted for substantially permanent closure of said central opening.

9. The plug of claim 8 wherein said wiper cup is one of a plurality of said wiper cups.

10. The plug of claim 8 wherein said insert is positioned on a shoulder defined on said body member.

11. A cementing plug apparatus for use in cementing a length of well casing in a well, said apparatus comprising:

a pair of substantially identical plug subassemblies, each of said plug subassemblies comprising:

a generally cylindrical body member defining a central opening longitudinally therethrough; and

an outer jacket disposed around said body member, said jacket having a resilient wiper cup extending therefrom adapted for wiping engagement with an inner surface of said length of casing;

a shearable insert positionable in one of said body members for temporarily closing said central opening in said one body member and for rupturing and thereby opening said central opening in response to a predetermined differential pressure thereacross; and

a substantially non-shearable insert positionable in the other of said body members for substantially permanently closing said central opening in the other body member.

12. The apparatus of claim 11 wherein said jacket is made of an elastomeric material.

13. The apparatus of claim 11 wherein said wiper cup is one of a plurality of wiper cups extending from said jacket.

14. The apparatus of claim 11 wherein said wiper cup has an outer surface extending upwardly and outwardly at an acute angle with respect to a longitudinal axis of the corresponding body member.

15. The apparatus of claim 11 wherein:

said body member has a recess defined therein adjacent to said central opening;

said shearable insert is positioned in the recess of said one of said plugs; and

said non-shearable insert is positioned in the recess of the other of said plugs.

16. The apparatus of claim 11 wherein said shearable insert comprises:

a ring portion; and

a domed portion extending upwardly and inwardly from said outer ring portion.

17. The apparatus of claim 11 wherein said shearable insert comprises a substantially flat disk of substantially uniform thickness.

18. The apparatus of claim 11 wherein said non-shearable insert comprises a substantially flat disk of substantially uniform thickness.

19. A cementing plug apparatus for use in cementing casing in a well, said apparatus comprising:

a first cementing plug comprising:

a first body member defining a first central opening therethrough;

a first jacket disposed on said first body member, said first jacket having a wiper cup extending therefrom adapted for wiping engagement with an inner surface of the casing; and

a replaceable first insert disposed adjacent to said first body member for temporarily closing said first central opening and subsequently shearing when subjected to a predetermined pressure, thereby opening said first central opening; and

a second cementing plug comprising:

a second body member defining a second central opening therethrough;

a second jacket disposed on said second body member, said second jacket having a wiper cup extending therefrom adapted for wiping engagement with an inner surface of the casing; and

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- a replaceable second insert disposed adjacent to said second body member for substantially permanently closing said second central opening.
20. The apparatus of claim 19 wherein:
said first and second body members are substantially identical; and
said first and second jackets are substantially identical.
21. The apparatus of claim 20 wherein said second insert comprises a substantially flat disk.
22. The apparatus of claim 19 wherein said first and second inserts are interchangeable.
23. The apparatus of claim 19 wherein said first insert is a selected one of a plurality of inserts shearable at a corresponding plurality of predetermined pressures.
24. The apparatus of claim 23 wherein said first insert comprises a substantially flat disk.
25. The apparatus of claim 23 wherein said first insert comprises:
an outer ring portion; and
an inner domed portion integrally formed with said outer ring portion.
26. The apparatus of claim 19 wherein said first and second jackets are made of an elastomeric material.
27. The apparatus of claim 19 wherein:
said wiper cup on said first jacket is one of a pair of wiper cups; and
said second wiper cup on said second jacket is one of a pair of wiper cups.
28. The apparatus of claim 19 wherein said wiper cup on said first jacket and said wiper cup on said second jacket have a conical outer surface extending upwardly and outwardly at an acute angle with respect to a longitudinal axis of said first and second body members.
29. The apparatus of claim 28 wherein said wiper cups are made of an elastomeric material.
30. The apparatus of claim 19 wherein:
said first body member defines a first shoulder therein;
said second body member defines a second shoulder therein;
said first disk is disposed on said first shoulder; and
said second disk is disposed on said second shoulder.
31. A plug for use in a well casing, comprising:
a body member defining a central opening therethrough;
a jacket disposed around said body member and having a wiper cup extending therefrom for engaging an inner surface of the casing; and
an insert disposed in said central opening for at least temporary closure thereof, wherein said insert is a shearable member or a substantially non-shearable disk.
32. The plug of claim 31 wherein said insert is one of a plurality of shearable and non-shearable inserts.
33. The plug of claim 32 wherein said inserts are interchangeable.

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34. The plug of claim 31 wherein said insert is a substantially flat disk having a substantially uniform thickness.
35. The plug of claim 31 wherein said shearable member is adapted for shearing and opening said central opening when a predetermined differential pressure is applied across said shearable member and said non-shearable disk is adapted for substantially permanent closure of said central opening.
36. The plug of claim 31 wherein said shearable member is made of a rupturable material.
37. The plug of claim 31 wherein said shearable member is one of a plurality of available thicknesses so that the shear pressure may be predetermined.
38. The plug of claim 37 wherein said ring portion and said domed portion are integrally formed.
39. The plug of claim 31 wherein said shearable member comprises:
a ring portion; and
a domed portion extending from said ring portion.
40. The plug of claim 31 wherein said insert is positioned on a shoulder defined on said body member.
41. The plug of claim 31 wherein said jacket is made of an elastomeric material.
42. The plug of claim 31 wherein said wiper cup is one of a plurality of such wiper cups.
43. The plug of claim 31 wherein said wiper cup has an conical outer surface extending upwardly and outwardly at an acute angle with respect to a longitudinal axis of the plug.
44. A plug for use in a well casing, comprising:
a body member defining a central opening therethrough; and
an insert positioned for at least temporary closure of said central opening, wherein said insert comprises:
an outer ring portion, and
an inner portion extending from said outer ring portion, wherein said inner portion is thinner than said outer ring portion and has a variable thickness.
45. The plug of claim 44 wherein said outer ring portion and said inner portion are integrally formed.
46. The plug of claim 44 wherein said outer ring portion and said inner portion form an internal corner.
47. The plug of claim 46 wherein said corner is radiused.
48. The plug of claim 44 wherein said inner portion has a first thickness at a center thereof and a second thickness at an outer portion thereof adjacent to said outer ring portion.
49. The plug of claim 48 wherein said inner portion is an outwardly convex domed portion.
50. The plug of claim 49 wherein said domed portion has a height above said outer ring portion approximately equal to said first thickness.
51. The plug of claim 48 wherein said first thickness is less than said second thickness.

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